UNIVERSITY OF ALBERTA

LOGICAL FORM AND LF

BY

JOANNE M. CEY

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS.

DEPARTMENT OF PHILOSOPHY

EDMONTON, ALBERTA

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ISBN 0-315-73271-7

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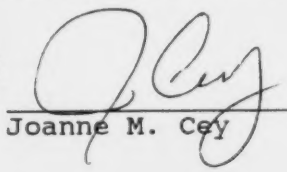
X 

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THE UNDERSIGNED CERTIFY THAT THEY HAVE READ, AND RECOMMEND TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH FOR ACCEPTANCE, A THESIS ENTITLED LOGICAL FORM AND LF SUBMITTED BY JOANNE M. CEY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS.

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ABSTRACT

This thesis is about logical form. It consists of four basic parts: an outline of two theories of logical form, a comparison of the two theories, and the consideration of some general questions about logical form.

The first theory of logical form is that of the analytic philosopher of language. It is a theory which holds that there is a level of language that lies beneath the surface. This level can only be accessed in an intuitive manner, through the propositions to which logical forms are attached. It is through this logical form level that meanings are reached and understood.

The second theory of logical form is that of the modern linguist. The theory outlined is of the logical form called (LF) which appears in Government and Binding theory (GB). LF is a syntactic level of representation in a syntactic theory, yet as a logical form, it is the key to meaning and is thus in some sense semantic. This fact raises questions about the relationship between syntax and semantics.

The third main area of this thesis is a discussion of the strengths and weaknesses of the two theories when measured against one another. This discussion includes a consideration of both the syntactic and semantic elements of each theory.

The final area of discussion in this thesis is that of the general questions raised in a discussion of logical form. There are five main questions discussed in this final area. They include issues of the reality of logical form, whether LF is a logical form (or the logical form), whether there are propositions between surface structure and logical form, whether LF can be made to fit into the philosopher's theory of logical form, and whether logical form is in some sense the key to finding relationships between natural languages.

While this thesis does not claim to answer these questions entirely, a discussion of them will prove fruitful, and serves as a way to orient the specific questions of logical form and LF in the greater context of questions about language and language understanding.

ACKNOWLEDGEMENTS

I am indebted to the members of my committee, Dr. F.J. Pelletier, Dr. M. Matthen, and Dr. F. Ferreira, for their comments and suggestions on the thesis and on the subject on which it is based.

I am particularly indebted to my thesis supervisor, Dr. B. Linsky, who offered help at every step on the road to this thesis and who provided information and ideas when they were lacking.

While acknowledging the assistance of all concerned, I must retain responsibility for any errors which might remain in this thesis.

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CHAPTER 1

INTRODUCTION

The term 'logical form' is not a new one in the philosophy of language. In fact, the notion of a way to represent the logic of a natural language without also representing phonetic features and surface level structure of that language has been considered for nearly as long as has the general area of the philosophy of language. When first mentioned in philosophical literature 'logical form' appeared only as a vague notion: the idea was there, but neither details of appearance nor of usage were included. Over time, philosophers enlarged on the notion, adding ideas about what logical form might look like as well as what the connection might be between a natural language and the somehow connected logical form.

Interest in logical form is not restricted to the field of philosophy. Linguists have taken the idea and have expanded on it, although their consideration proceeds in a slightly different direction than that of philosophers of language. The linguistic notion of 'logical form' takes a clear shape and an even clearer

importance in the recent work of Noam Chomsky[1] and in that of linguists following Chomsky's tradition. Although some of the details of logical form as seen by linguistic theory differ from those of philosophical theory, it is clear that they point towards answering some of the same questions. It is also clear that the theories within the two disciplines can be compared, and the comparison might well point toward a clearer understanding of the concept of logical form and what its significance is both in the philosophy of language and in linguistics.

The purpose of a logical form level of language is to provide a bridge between the appearance of language and the meaning. The connection of logical form to meaning is explained as follows:

> On the one hand, as <u>logical</u> form it has a claim to logical and semantical significance and thereby a connection to meaning, in a broad sense. On the other hand, as logical <u>form</u> it has a claim to formal, syntactical, grammatical, or generally representational significance. The allure of logical form is thus that of representation transparently related to meaning.[2]

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[1]These include all of Chomsky's work on GB theory and EST, which comprise the bulk of Chomsky's linguistic work since the late 1970s. See Chomsky [1981], [1982], [1986a], and [1986b] among others.

[2]Neale and Larson [1991] 142.

The logical form level of representation, then, has a definite purpose, that of providing a bridge between syntax and semantics.

The consideration of logical form has recently become quite popular. Robert May makes this clear in the Preface to an issue of Linguistics and Philosophy which considers (in part) the semantics of logical form:

> Over the past decade, one of the main trends in the study of the relation of the syntax and semantics of natural language has been the theory of Logical Form (LF). Since its inception in the mid-1970's, a primary concern of this approach has been on how various syntactic constraints conspire to determine logical structure, as represented at LF, as an aspect of the grammars of natural languages. More recently, interest has become increasingly directed toward the semantic implications of LF, with research becoming focused not only on the structural aspects of this level, but also on the particulars of its semantic interpretation.[3]

This thesis will deal with both of these issues -- structure and semantics -- in at least a cursory way. Particular questions of interest within this thesis on logical form include the following. Given different theories of logical form (from the points of view of both philosophers and linguists) which is the logical form? Are the theories hopelessly in disagreement on major

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[3]May [1989] 382.

issues, or do they say the same thing, only in different terminologies? Is logical form 'real' (in any of several senses -- to be discussed later -- in which it might be real), and if it is which is the 'real' theory? What does the existence of logical form do for our understanding of language?

This thesis will provide a basic outline of each of two main theories of logical form while also mentioning several others. For simplicity of terminology these main theories will be called the philosopher's theory and the linguist's theory, although two other theories will be introduced which might deserve the title 'the philosopher's theory.' These latter two theories will be called 'the logician's theory' of logical form and 'the Davidsonian theory' of logical form. While these titles may imply a polarization between a linguist's outlook and a philosopher's, this is not intended. It is possible -- and it is becoming more common with time -- that philosophers are adopting what I call the linguist's position and vice versa. The philosopher's theory discussed in this thesis is a representative position on logical form which could be adopted by a philosopher and is based on the work of several philosophers of language, and the linguist's theory is an example of a position on

logical form which is based on the work of several linguists.

Following separate discussions of these two theories of logical form, a comparison of the strengths and weaknesses of these two theories is made possible. Finally, a consideration of the more general theoretical questions surrounding the concept of logical form will be made. By this method it is possible to both provide a picture of what logical form looks like and how it is of use; both detail and overview can be accomplished.

As it is the purpose of this thesis to outline and compare two main theories of logical form, and each of the theories will be built from the work of several scholars, terminological difficulties are unavoidable. They are not, however, insurmountable. In order to provide a coherent account of each theory of logical form, it is necessary to establish a standardized vocabulary for the purposes of this thesis. This is a task which I will accomplish by using items of vocabulary both from the philosophy of language and from linguistics. The terminology used in the philosopher's theory of logical form and the modern linguist's logical form will then be similar enough that the comparison of the two theories in a later chapter will not be so plagued by conflicting terminology as it would otherwise be.

Two of the central terms which are necessary in a discussion of logical form are 'surface structure' and 'logical form.' 'Surface structure' is a phrase taken from modern linguistics. It is used to represent the level of language which we speak or write (ie. the English -- or any other natural -- language). Other terms which are sometimes taken to mean similar things are 'phonetic form,' 'grammatical form,' 'S-structure,' 'normal language,' and 'ordinary language,' although each of these terms has certain connotations which differentiate it from 'surface structure.'[4] With the exception of quotations, the only one of these terms that will appear in the following discussion is 'surface structure.'[5] In addition to its use as a general term referring to a level of language, 'surface structure' will be used to refer to sentences which are of surface structure -- instead of being called a sentence, the group of words will be called

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[4]In particular, 'S-structure' in Chomskian linguistics represents a separate and distinct level of language from that of surface structure. Despite this fact, some philosophers and linguists use the terms as though they represented the same level of language.

[5]The term 'surface structure' has been used by Chomsky since the beginning of his work in syntax, and appears in the work of other linguists since the 1950s. Its exact definition has, however, evolved somewhat. The definition used here comes from Chomsky [1981].

a surface structure. Context will indicate which of these meanings is appropriate in a given instance of this term.

The term 'logical form' appears in both the work of philosophers of language beginning in the early 20th century, and in the vocabulary of the modern linguist. Not surprisingly, the term is used in a number of ways, and is intended to convey different things. Part of the project of this thesis is, of course to determine what exactly is meant by the term logical form, however certain explanatory comments can be made here. 'Logical form' will be used in primarily three ways. Uncapitalized, it refers to the concept of logical form in general or to a philosopher's conception of logical form in particular. Capitalized (eg. Logical Form) or abbreviated as 'LF,' the term 'logical form' refers to the specific theory of logical form espoused by linguists following Noam Chomsky. This makes it possible, for example, to say 'Logical Form is an example of logical form' without descending to the level of meaninglessness. In addition to these two uses, which are noted by the presence or absence of capitalization, there is a third use of logical form. A 'logical form' or in linguist's theory a 'Logical Form' or 'LF' is a sentence in logical form or LF in the same way as a 'surface structure' may be a sentence of surface structure. Although the dual usage of the terms may

initially seem to further confuse the issue it has the advantage of eliminating talk of sentences at levels of language which do not properly have sentences.

The use of one final term should be discussed before moving on to the business of this thesis. The term is 'proposition.' 'Proposition' is a loaded term in philosophy, and nearly everyone who has an interest in propositions has her own theory on what properties propositions have. Propositions are sometimes thought to have form, and sometimes not. They are sometimes thought to be sets of possible worlds or truth conditions. For the purpose of this thesis propositions will be taken to be without intrinsic form, although as we shall see, form can be attached to propositions. The issue of whether propositions can be expressed as sets of possible worlds or as sets of truth-conditions is not centrally relevant to the use of the concept 'proposition' in this thesis, and so will not be discussed here. In the analytic philosopher's theory of logical form it will be said that propositions underlie surface structures. It is in this sense that the term 'proposition' will be used. It's use is similar to what might be conveyed by using the term 'thought' or 'concept' or 'idea' in other theories, inasmuch as each of these is sometimes said to be what underlies a surface structure. The proposition is what we

understand when we hear or read a surface structure, the content without any syntactic form.[6]

With this outline of the reasons for use of the main terms that will appear in later chapters, it is possible to move on to the first task of this paper: the outlining of philosophers' theories of logical form. This outline is based on several of the early texts which are important to the discussion of logical form, but also includes information from and about more recent philosophers' considerations of the subject.

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[6]The use of the term 'proposition' has been adopted for convenience from among the possible terms to convey the sense intended. It appears in this context in Wittgenstein [1922].

CHAPTER 2

PHILOSOPHERS' LOGICAL FORMS

2.0 - Introduction

Although the introduction speaks of 'a' philosopher's theory of logical form, it would be short-sighted and naive to claim that there is only one such theory used by philosophers or to claim that all philosophers who use the term 'logical form' use it in the same way. There is one particular philosopher's theory of logical form which I wish to discuss in this thesis, but in the interest of completeness mention must be made of two other philosopher's theories of logical form which proceed differently from the analytical philosopher's theory of logical form which will be outlined later in this chapter.

It might be said that the idea of a 'logical form' which underlies the surface structure of language can be traced back to Aristotle. Indeed, postulating such a level would fit in with Aristotle's discussion of language, although he does not himself use the term 'logical form.' 'Logical form' is found in the works of philosophers of language as early as 1913. Bertrand Russell states:

> Enough has been said, I hope, to show that acquaintance with logical form, whatever its ultimate analysis may be, is a primitive constituent of our experience, and is presupposed, not only in explicit knowledge of logic, but in any understanding of a proposition otherwise than by actual acquaintance with the complex whose existence it asserts.[7]

Aside from being a very early use of the term 'logical form,' this statement also serves to indicate how important logical form must be to the understanding of language. Russell provides a strong explanation of why philosophers want to study logical form, whatever logical form might turn out to be.

Not all philosophers of language believe that logical form is a part of understanding language or levels of language. Among those who do, however, there seem to be three main traditions followed. The first of these might be called the logician's theory of logical form, as it utilizes a notion of intensional logic as a central part of the theory. The second is a Davidsonian theory of logical form which appeals to truth conditions to explain and portray logical form. The third, the one in which this thesis is primarily interested, is the analytical philosopher's logical form. It is a theory which primarily follows the work of Russell and Gilbert Ryle.

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[7]Russell [1913] 99.

2.1 - Logician's Logical Form

The logician's logical form can be best characterized in terms of intensional logic. To the adherents of this theory, providing the logical form of a surface structure is no more than translating the surface structure into an appropriate system of intensional logic. This logical sentence is the logical form of the surface structure which it represents. The logical form thus explained meets the two central criteria by which logical form is explained: it is syntactically explicit and disambiguated, and it is the form from which meaning (particularly truth conditions) is read.

Some logicians refer to any sentence in the logical notation of a given system of logic as being a logical form. This is, however, oversimplifying the situation. A sentence symbolized in a system of sentential logic contains considerably less syntactic detail than the same sentence represented in intensional logic. As a result, it may be impossible to read truth conditions from the simpler representation, or if they can be read they may misrepresent the given surface structure. As a result of the limited capacity of some simpler systems of logic, most logicians have come to realize that an appropriate

logician's account of logical form must be one which can deal with as many facets of a surface language as possible, including intensional operators. Thus it is intensional logic which is said to represent logical form in the logician's account.

At least as much as it is the function of logical form to provide disambiguated and explicit syntax, it must also provide some account of the meaning of the surface structures which it represents. The purpose of representing sentences in intensional logic is, at least in part, to provide direct access to truth-conditions for the sentence(s) in question. As such, the logician's theory of logical form meets this semantic requirement made of logical form in that the logical form of a sentence provides access to the truth-conditions and thus to an account of meaning.

There is a variant of logician's logical form which might be confused with the next type of logical form (which will be called 'Davidsonian logical form') because this variant is one which is actually held by Donald Davidson. (The theory called 'Davidsonian logical form' here is actually theory derived from Davidson's ideas by Ernest LePore. LePore's theory differs greatly from the logician's logical form.)

Davidson's account of logical form is certainly compatible with the logician's theory. What Davidson does is assumes the background and basic tenets of a logician's theory of logical form and adds to it certain features which he considers necessary to the correct characterization of the logical forms of certain types of sentences.

These additions stem from Davidson's 1967 paper entitled "The Logical Form of Action Sentences." In this paper, Davidson considers what form a sentence such as:

(1) Jones buttered the toast slowly, deliberately, in the bathroom, with a knife, at midnight.

might have.[8] Concern over event sentences such as (1) arises because of entailment relations. For example, from (1) I can intuitively infer that

(2) Jones buttered the toast

(3) Jones buttered the toast with a knife

and other combinations of the parts of the event chronicled in (1). The logician's logical form of this sort of sentence does not account for how the inferences can be made, so Davidson concludes that the actual logical form of such sentences must be different. Specifically, Davidson holds that the logical forms must incorporate

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[8]The example is Davidson's. [1967] 105. Note that all examples in this thesis will be numbered consecutively to facilitate reference.

some feature which makes it possible to explicitly reach sentences such as (2) and (3) from (1).

Davidson's proposal for the logical form of action sentences proceeds as follows:

> The basic idea is that verbs of action -- verbs that say 'what someone did' -- should be construed as containing a place, for singular terms or variables, that they do not appear to. For example, we would normally suppose that 'Shem kicked Shaun' consisted in two names and a two-place predicate. I suggest, though, that we think of 'kicked' as a <u>three</u>-place predicate, and that the sentence to be given in this form: (There exists an x)(Kicked (Shem, Shaun, x)).[9]

As a result of this account of the logical form of action or event sentences, it can be seen that the logical forms of action sentences in Davidson's theory differ significantly from the logical forms suggested by other logicians.

The differences between the main branch of logicians' theories of logical form and that of Davidson are not, however, confined to action sentences. Rather, Davidson's thoughts about action sentences simply reflect his ideas about the logical forms of a great many types of sentences. Davidson holds that for all sentences which imply the existence of some event, the logical form of the sentence must quantify over the event said to exist in

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[9]Davidson [1967] 118. Davidson uses the standard logical symbol for 'There exists an,' but I am unable to reproduce it clearly.

order to capture the inferences made by the sentence. This sort of quantification in addition to the quantifiers required by the logician's theory make up the theory held by Donald Davidson.

Two further comments about Davidson's program will serve to put his theory of logical form in better perspective. Tyler Burge makes the following general comment on how he perceives the task of logical form following Davidson,

> The original and primary purpose of a theory of logical form is systematically to identify those formal structures in a language or discourse that mirror the deductive arguments that are formally valid. Such a theory will inevitably serve not only an account of validity, but also an account of truth conditions, whose interest and importance Davidson has done much to make manifest.[10]

Burge also stresses that it is the forms of 'logical terms' which are primary to an understanding of logical form.[11] It is an account of logical form such as this one which Etchemendy criticizes, claiming that it is not the form of logical terms which are of interest, but rather the grammatical forms of sentences.[12]

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[10]Burge [1986] 200.

[11]Burge [1986] 201ff.

[12]For a discussion of Etchemendy's position on the utility of logical form, see the end of this chapter.

2.2 - Davidsonian Logical Form

As was mentioned earlier, the theory which I am characterizing as Davidsonian Logical Form is the work of Ernest LePore which is derived from LePore's understanding of Davidsonian theory. LePore bases his understanding of Davidsonian theory primarily upon Davidson's remarks about being able to understand natural language by breaking sentences down so that they take the forms of the Tarskian truth definitions which lead to a determination of their truth.

LePore notes the following comment of Davidson's: "Theories of absolute truth necessarily provide an analysis of structure relevant to truth and inference. Such theories yield a non-trivial answer to the question what is to count as the logical form of a sentence."[13] From this, and from other remarks of Davidson's about truth theory, LePore postulates that logical form is nothing but the sum of the clauses of a Tarskian truth definition which are necessary to accessing the truth of a sentence. That is, instead of claiming that logical form has the appearance of some system of intensional logic, and is therefore an intermediate step between surface

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[13]LePore ([1986] 11) cites this quote as [DCT:71]. I leave it to the reader to decipher LePore's code.

structure and truth and meaning, LePore holds that logical form is simply a restating of the parts of a Tarski-like truth definition for the relevant surface structure.

LePore's theory of logical form differs markedly from any of the other theories of logical form which will be discussed in this thesis, and this difference is the main reason why it is mentioned here. LePore provides a model of logical form which does not resemble a logical language. It does not have quantifiers and variable, nor does it have Empty Categories and movement rules. For LePore, a level of logical form simply contains the clauses of a truth definition and the ways in which they are linked in order to represent the truth of a sentence.

The existence of LePore's theory indicates that logical form can be conceived of in ways radically different from those which will be finally considered in this thesis. LePore, in his search for the truth conditions of surface structures, cuts out the 'middleman,' the level which many of his colleagues call logical form, and proposes that logical form is no more than the statement of the clauses of the truth definition needed to determine the truth of the surface structure in question. While this view of logical form is a minority one, it must be considered in any comprehensive

consideration of logical form, for it indicates how widely the concept of logical form may be understood.

2.3 - Analytical Philosopher's Logical Form

The reconstruction of the analytic philosopher's theory of logical form that will be used in this thesis involves both a chronological approach to the history of the theory and a consideration of the main components of the theory. After outlining the basics of the analytic philosopher's theory of logical form, a consideration of some of the major issues of and changes in the theory will be made.

The analytical philosopher's theory of logical form (which I will often refer to as 'the philosopher's theory' for brevity) which will be outlined here is based primarily on the work of Bertrand Russell and Gilbert Ryle. The central source from which the theory is taken is Gilbert Ryle's "Systematically Misleading Expressions."[14] By taking the theory as outlined in Ryle's paper and augmenting it with comments made by Bertrand Russell in several different sources, I will set

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[14]Ryle [1931].

out the basics of an analytical philosopher's theory of logical form.

According to the analytical philosopher's theory, logical form is the syntactic form which attaches to, and underlies, propositions. Wittgenstein describes the relationship by stating that "[p]ropositions can represent the whole reality, but they cannot represent what they must have in common with reality in order to be able to represent it--the logical form."[15] Each proposition has a logical form attached to it, but the proposition does not itself directly assert its logical form. A proposition can be understood without any understanding of, or even knowledge of, the logical form underlying it.

Ryle points out that we generally understand what is meant by a surface structure, but asserts that this is usually done without an awareness of the 'real' form of the proposition which is conveyed by the surface structure. Ryle does not mean to suggest that the average person does, or even should, analyze the logical forms of propositions in order to understand them: after all, we understand one another without considering logical form. It is when the language itself is considered that logical form becomes of interest:

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[15]Wittgenstein [1922] 4.116.

> There is a trap in the form of expression[s], but a trap which only threatens the man who has begun to generalize about sorts or types of states of affairs and assumes that every statement gives in its syntax a clue to the logical form of the fact that it records.[16]

Ryle indicates that the surface structure of a proposition does not always accurately reflect the proposition's logical form and that it is the task of the philosopher to consider what the actual logical forms of propositions are.

The task of the philosopher is to "discover and state what is really meant by expressions of this or that radical type."[17] This can be done by considering propositions which,

> though they are perfectly clearly understood by those who use them, are nevertheless couched in grammatical or syntactical forms which are in a demonstrable way <u>improper</u> to the states of affairs which they record.[18]

The use to which the concept of logical form is put by Ryle is as follows: "expressions can be reformulated and for philosophy but <u>not</u> for non-philosophical discourse must be reformulated into expressions of which the syntactical form is proper to the facts recorded."[19] The

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[16]Ryle [1931] 88.

[17]Ryle [1931] 86.

[18]Ryle [1931] 87.

[19]Ryle [1931] 87.

logical form is the syntactical form proper to the facts of any given proposition.

Ryle refers to "facts of quite another logical form than the facts recorded."[20] in such a way that it is clear that any proposition can have only one logical form. Also, as will become clearer later, each logical form is appropriate to one and only one proposition. This suggests that while the logical form of a proposition is not identical with the proposition, and while it is possible to know the proposition without knowing its logical form, the logical form is not entirely separable from the proposition.

Thus far, the main detail about logical form which is made clear is that logical forms are attached ins some way to propositions. It is somewhat difficult to say anything about the appearance logical forms within a surface structure language because by definition they are not expressed by surface structure. Indeed if surface structures always accurately reflected logical forms, logical forms would be redundant.

Given that, according to Ryle, logical forms are somehow attached to propositions, there would appear to be

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[20]Ryle [1931] 87. Note the Ryle uses the term 'fact' in the same way in which Wittgenstein uses 'proposition.' The two can be read as the same in this case.

no way of being misled about the logical form of a proposition. However, the possibility of being mislead does occur, because the surface structure representing a proposition does not always resemble the logical form of the proposition, and because propositions can be understood without an understanding of their logical forms. According to Ryle, some surface structures "are formally improper to the facts of the logical form which they are employed to record and proper to facts of quite another logical form."[21] While a proposition can be expressed by more than one surface structure, according to Ryle some (if not all) of these ways misrepresent the logical form of the proposition expressed. That this is so is best illustrated by example. Consider the following four surface structures:

(4) Bill killed Ted with a gun.

(5) Ted was killed by a gun fired by Bill.

(6) A gun was used by Bill to kill Ted.

(7) Ted's death was caused by Bill using a gun.

Sentences (4) through (7) have the same content (in the normal, non-technical sense of the word content). They all express some proposition which involves Bill, Ted, and a gun, but each of them has a surface structure which is

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[21]Ryle [1931] 90.

different from the others. Ryle claims that "a fact or state of affairs can be recorded in an indefinite number of statements of widely differing grammatical forms [but] it is stated better in some than in others."[22] It is possible that one of the surface structures may reflect the correct logical form of the proposition, but it is not necessary and clearly not all of them do. It is the responsibility of the philosopher to decide which (if any) of the surface structures represents the proposition's logical form. Now consider an example of two sentences which seem to be of the same surface form but whose logical forms differ:

(8) Graham is a better chess player than David.

(9) Nobody is a better chess player than David.

At the level of surface structure, (8) and (9) appear to have exactly the same form, or more precisely, the forms of the propositions meant appear to bear striking similarities. The logical forms of the sentences, the forms of the propositions meant, are quite different. The primary difference between the two sentences is that the subjects, although they are indeed both nouns, have very different logical properties. The subject of (8) is an individual (whether existent or non-existent is

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[22]Ryle [1931] 98.

irrelevant) who has the attribute of being a better chess player than David whereas the subject of (9) is a class of individuals (possibly empty) who share the attribute of not being better chess players than David.[23]

Surface structures (8) and (9) illustrate a need for a formal level other than surface structure. The surface structures of the two sentences have the same form, but the forms of the propositions -- their logical forms -- are quite different, and it is that difference between (8) and (9) which leads to their differences in meaning. It is these features of the relationship between surface structure and propositions -- different sentences representing the same proposition and sentences which seem to have the same form but which do not -- which lead analytic philosophers to believe that there must be a theory of logical form.

The logical form of a proposition may closely resemble that of another proposition, or it may be quite unique. Either way, according to the basic claims which necessitate a theory of logical form, the logical form of a proposition is not transparent. Indeed, it is opaque in two different ways. First, the logical form of a

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[23]This is the classic example of the sort of language which led Ryle and others to consider the idea of logical form. An example of a type of sentence which has generated more recent critical interest is 'Mr. Pickwick exists'.

proposition is not made explicit by the surface structure which expresses the proposition. If it were, surface structure and logical form would have exactly the same form, and there would be no systematically misleading expressions of the varieties discussed by Ryle. That there are such misleading expressions is clear from (8) and (9): a glance at the surface structures indicates that the forms are the same, but at a deeper level they are different. Second, it is possible to grasp a proposition without grasping the form underlying the proposition.[24] The task of interpreting surface structures so as to understand the underlying propositions is what we do whenever we use language. Ordinary language users do this every day without understanding on a conscious level the logical forms of the propositions grasped. An explicit awareness of logical form is thought by Ryle to be only of use to the philosopher.[25]

As a result of the two sorts of opacity of logical forms, the task faced in reaching the logical form of a proposition from the surface structure which expresses the proposition is two-fold. First, the proposition

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[24]This is one of the assumptions of Ryle [1931]. If it were not possible to perceive a proposition without also perceiving its logical form, there would be no problem perceiving logical forms.

[25]Ryle [1931] 86-87.

underlying the sentence must be discovered or understood. This is done by anyone who understands language. This being done, the logical form of that proposition must be determined. Assuming, as does Ryle, that the surface form of a sentence does not always mislead one as to the form of the underlying proposition, this second task is further complicated by the need to determine whether the logical form of the proposition resembles the surface structure of the sentence expressing it, or whether the surface structure and the logical form are entirely different in appearance. Then, if the form is misleading the correct form must be sought. This second task, that of discovering the logical form of a proposition given the proposition, is the task which is of primary interest to the philosopher of language. As a result it will be the second of the two tasks involved in finding logical form which most interests us here.

2.4 - Propositions and Logical Form

Before discussing the relationship between surface structure and logical form, one further issue should be discussed. In the accounts of logical form presented by Ryle and others, how does one get from knowledge of a proposition to knowledge of that proposition's logical form? The method, which is in some ways the key factor in understanding both the concept and the use of logical form, is conspicuously absent in the account of logical form given by Ryle, and Russell posits a notion of logical form only in the sense of basic relations. Although both men make clear in their discussions that a need for the method would only be had by the philosopher, not the average user of language, only the general outline of a method for revealing logical form is presented. The desire for a method is based on several factors. First, a method for finding logical form would go a long way towards explaining both what logical form is thought to be and why it is thought to be important or necessary. Second, if the logical form of propositions is ever to be predicted, a method is necessary, and an ability to predict the logical forms of propositions is useful in a

complete understanding of the ways in which language works.

Although the reasons for seeking the logical form of propositions may be clear to Ryle and Russell, and they may understand the usefulness of postulating the existence of the level, how to get to the level of logical form is quite unclear. As the logical form of a proposition is opaque given the proposition, some sort of work must be done to get from the proposition to it's logical form, complete or structured method for doing so is outlined in the works in question; indeed it is never made clear whether Ryle and Russell consider this to be a matter of plugging variables into equations, or of following a set of rules, or perhaps of pure intuition.

2.5 - Surface Structure and Logical Form

Turning now to the relationship between the surface structure, the underlying proposition, and the logical form of the proposition, the question of whether movement between one level and another is rule governed is again immediately relevant. As language users, we habitually discover the propositions underlying surface structures -- after all we understand them. Our understanding does not appear (at least to Ryle) to be a matter of employing any

set of rules or algorithms, but rather of an intuitive leap. Upon hearing or reading a surface structure, either the proposition meant is grasped or not, or can be subsequently explained or not. There appears to be no way to determine in advance whether the proposition will be clearly understood, or (if it is not) why it is not understood. In short, it appears that all of our understanding of spoken or written language as well as our understanding of how to use language is based on intuition and not on overt rules. We can learn about grammar and syntax, but most of us would assert that we intuitively know whether a sentence makes sense or is correct without appealing to rules or laws.

The relationship between a proposition and the logical form belonging to or attached to it must be of one of the following three types: rule-governed, partly a matter of rules and partly a matter of convention, or wholly a matter of convention. Ryle is sceptical of both the ascription of natural rules and of convention as the explanation of the move from surface structure to logical form. Forced to decide between the two, however, he says "the propriety of grammatical to logical forms is more nearly conventional than natural: though I do not suppose

it to be the effect of whim or of deliberate plan."[26] It seems appropriate to say, then, that given the choice between the three positions which are possible Ryle would state that there are aspects of both natural rules and conventions involved in the move between surface structure and logical form. As Ryle is dubious about the existence of explicit and natural rules regarding the move at issue, but believes that there is more to the process than caprice, the best explanation of this procedure from Ryle's point of view is that it is based on intuition -- unconscious use of rules. What these rules might be remains unstated in Ryle's account of logical form, and even in Russell's program of mathematical logic many of the moves between surface structure and logical form are made by intuitive leaps.

To us in the last part of the 20th century, a procedure for understanding a part of language or of anything else which is not explicitly governed by known rules seems implausible at best. Nevertheless an explanation of the logical form of surface structures which is based solely on intuition does fit in with the standard way in which we see our understanding of language. We are all veteran language users, and most of

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[26]Ryle [1931] 99.

us can identify the propositions underlying surface structure most of the time. Despite this ability, very few language users would say that their understanding of language is based on a system of rules for interpreting language. Certainly such rule use is not conscious or explicit. It should not be surprising if we are capable, on the strength of our long practice in doing so, of intuiting what surface structures map onto which logical forms. While this does not provide a concrete predictive method for performing such tasks, it does at least provide an explanation of how we manage to do the mapping that we clearly do.

The claims of any number of language users that there is no rule system governing the understanding of propositions does not, however, make it the case that there are no rules. Even more clearly, the claims say nothing about whether the move from propositions to their logical forms is rule governed, for the ordinary language user has no conscious use for (and usually no explicit knowledge of) a logical form level of language. Further consideration is clearly necessary before any concrete claims can be made as to whether the move from propositions to logical forms is one governed either entirely or in part by rules (either overt or unconscious). It remains the case, however, that the

theory of logical form put forward by Gilbert Ryle makes the claim that if the move in question is governed by rules, then they are unconscious and unknown (at least in Ryle's time). The possibility of uncovering the rules and stating them explicitly is left open by this theory, and indeed it is this task which occupies many linguists.

The picture of this philosopher's theory of logical form is perhaps a little fuzzy around the edges. Ryle did not make a proposal about what logical form would look like, although if he did, it could be expected to resemble one or another variety of logical notation (perhaps the intensional logic of the logician's theory). He did not provide an explicit way to arrive at this level of representation from surface structure, or even point at how one might try to arrive at the level beyond suggesting that the move is intuitive. Nevertheless, Ryle does emphasize the notion that there is a level of language underlying surface structure, and that representations at this logical form are attached to propositions on a one to one basis.

2.6 - Reasons for Logical Form

Given the interest that is presently being shown in the area of logical form, it seems that there must be some

reason for supposing that there is a level of logical form and/or that the level would be useful. To state the glaringly obvious, if there is to be a theory of logical form, a level of logical form must be supposed to exist. As the addition of logical form to any theory of language representation makes the latter theory much more complicated, there must be expected to be compelling reasons for the existence of logical form in order to add it. Whether there is or is not a logical form level of linguistic representation is something over which philosophers of language are still arguing. John Etchemendy holds a Davidsonian view of logical form, but unlike Davidson Etchemendy ultimately feels that logical form is not necessary or useful. According to Etchemendy, "What is crucial to a theory of logical form is just that sentences with different logical properties be assigned different logical structures."[27] This must be so even though two sentences with different logical properties might well have the same 'grammatical form' or surface structure.

Etchemendy claims that any theory of logical form is in some sense implausible. He makes this claim based on

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[27]Etchemendy [1983] 307. See also the discussion in Etchemendy [1990].

the idea that "a theory of logical form must assign distinct forms or structures to sentences displaying, from all appearances, the same grammatical form, simply on the basis of a difference in the logical properties of the sentences."[28] His point is well taken. Indeed at first glance it seems odd to take two sentences which appear to be very similar in structure and to say of them that their 'real' or 'underlying' structures are very different. However, this is not by any means a crushing blow to a theory of logical form. Appealing to intuitions, as does Etchemendy in making his claim, we know that things are often not as they appear on the surface. Why should it trouble us if language is not as it is on the surface? Admittedly, the inclusion of a level of logical form in a system of syntax will complicate the system, but that is not necessarily a reason to claim that the level does not exist.

At bottom, Etchemendy's complaint with logical form, or as he puts it "the doctrine of logic as form,"[29] is more formal than his initial intuitive claims. He holds that the function of a logical form level is essentially to cope with sentences of the same grammatical form whose

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[28]Etchemendy [1983] 307.

[29]Etchemendy [1983] 307-8.

meanings differ. Arguing that a logical form level exists primarily (if not exclusively) to make semantics formally explicit, he questions the connection made between logical structure and semantics. The conclusion to his 1983 paper is that he "fail[s] to see why formal or structural properties need be thought central to a semantic account of the logical properties of a language."[30]

Although Etchemendy's comment leads him to the conclusion that there need be no logical form, it leads me to a reason for supposing that logical form does exist. If there is a connection between semantics and form or syntax, then a logical form level -- a level of syntax at which semantic properties are made explicit and the syntax is disambiguated -- is profitable and perhaps even necessary. Robert May reaches this conclusion after asking a similar question to Etchemendy's. May wonders "whether the linguistic structure is the structure relevant for the truth-definition."[31] Unlike Etchemendy, May answers this concern with an affirmative answer.

The history of analytic philosophy offers up another reason to propose the existence of a level of logical form underlying ordinary language or surface structure.

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[30]Etchemendy [1983] 334.

[31]May [1990] 2.

Although this reason would be denied by many modern syntactic theorists, it would have proved powerful to philosophers such as Russell.[32] The feeling among many analytic philosophers ran toward claiming that everyday English (and presumably other natural languages) were sloppy and imprecise. Not only was (or is) the language being used in an imprecise manner; there was (or is) no way to make a surface structure language completely precise, or to precisely illustrate the syntax of the language. Given this perceived problem, a logical form level of representation would be seen as a way to remove the imprecisions, inaccuracies, and ambiguities of surface structure or natural language. Particularly in light of Gilbert Ryle's claims that natural language contains expressions and types of expressions which are systematically misleading, a need might be seen for a way to represent language in an entirely precise and non-ambiguous way.

Another reason why the analytic philosopher might hold that there is a need for logical form is that there

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[32]Russell [1959]. Discussion pertinent to this topic appears in "The Impact of Wittgenstein" (particularly 113) and "Universals and Particulars and Names" 163. Russell's view was that English is not a precise language, and Russell was looking for a precise language into which English could be translated. Russell also speaks about concealed logical form in Russell [1961].

is an interest in seeing the syntax of a language, and the relations between its parts spelled out. If the structure of language could be made explicit and precise, several goals could be realized. First, natural language could be shown to be intrinsically precise, even if its final manifestations were sloppy. Second, given explicit structure, the underlying structure of language could be accurately studied without consideration of its content. Finally, if the study of structure without content proved useful, logical form could turn out to have predictive features. The theory of logical form as a real level of language is seen, then, as one which might yield great rewards to the analytic philosopher. While this does not provide any sort of a concrete proof that there is a logical form level of representation or give any specific model of what the underlying logical form of propositions might look like, it does provide a set of reasons to hope for a theory of logical form.

CHAPTER 3

LINGUIST'S LOGICAL FORM

3.0 - Introduction

The concept of 'logical form' is not confined to philosophy. The concept is found in the work of a number of linguistic theorists, particularly those interested in syntax. One of the most familiar contemporary linguistic systems which includes a notion of logical form is the Government and Binding theory (GB theory) espoused by Noam Chomsky.[33] The GB conception of logical form is becoming the most common linguistic conception of logical form, and will therefore be considered to be the linguistic conception of logical form for the discussion in this thesis.

3.1 - GB Theory

In GB theory there are claimed to be four levels of syntactic representation, a movement rule which operates syntactically from one level of representation to another, and a series of syntactic constraints on this movement

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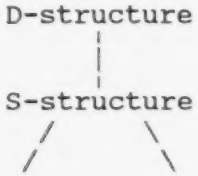
[33]The two texts considered central to Chomskian GB theory are Chomsky [1981] and Chomsky [1986b].

unnecessary for the topic at hand, and as a result the background of the theory and some of its working details will be passed over. What detail is of relevance to the discussion of logical form will be outlined in the following section, with particular attention paid to the rule 'Quantifier Raising' and to the use of 'Empty Categories.'[34]

The four levels of linguistic representation in GB theory are as follows. The base level is D-structure (also called deep structure). From this base, S-structure is reached through a set of syntactic manipulations called transformations. From S-structure, either PF (phonetic form, or the actual sounds and symbols of ordinary language) or LF (logical form) can be reached by performing the appropriate manipulations. The relationship of these levels to one another is shown by the following diagram:

(10)



[34]For a less technical introduction to GB theory see Lasnik and Uriagereka [1988], or McCawley [1982]. GB theory is also referred to as having evolved from Extended Standard Theory, or EST.

PF LF[35]

As the LF level is what interests us in looking for logical form, the discussion of GB theory within this thesis will be related primarily to the LF level and to the connections between it and surface structure. In discussion of moves from LF, most advocates refer to S-structure as if it were surface structure. This is due to the fact that S-structure contains all of the information possessed by PF except phonetic detail. In addition S-structure contains empty categories, so this distinction should be kept in mind by the reader. Despite this distinction, I will follow common practice and refer to S-structure and surface structure as being either very similar or the same. This is fruitful as there is a direct connection between S-structure and LF whereas no such connection exists between PF and LF.

3.2- Chomskyan Theory Before GB

Prior to GB theory, the standard Chomskyan theory of syntax was called Transformational Grammar (TG).[36] TG

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[35]Chomsky [1981] 17. This diagram is also widely reproduced in other literature on the subject of GB theory.

[36]The genesis of this theory is found in Chomsky [1957]. It is further developed in Chomsky [1965] and later in Chomsky [1975].

was thought to contain several levels of syntactic representation, most importantly D-structure and S-structure -- TG did not contain an LF level. Elements which GB theory assigns to LF, especially the connection implied between LF and semantics, were assigned by TG to D-structure. As such, all semantic issues were thought to be settled at D-structure and transformations to turn D-structure representations into S-structure representations were thought not to affect meaning. In most cases evidence bore this theory out, but not in all.

The problem was most prominent in cases where ambiguity (particularly scope ambiguity) was absent at D-structure but the transformational rules introduced ambiguity into corresponding S-structure representations. Consider the following sentence:

(11) A hundred students shot twenty professors.

As Ruth Kempson notes:

> "deep structure is the level at which such ambiguity should be characterised, particularly so since the ambiguity is structural and not due to a lexical item of the sentence being ambiguous. Yet the only way to specify the two interpretations of this sentence is by giving the logical form corresponding to these two interpretations."[37]

D-structure provides no way to analyze the ambiguity in (11) as the ambiguity which poses the problem is caused by

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[37]Kempson [1977] 165.

interpretation of scope. This fact lead to a conflict between the conception of D-structure as the level from which meaning was read and the fact that the meanings of sentences such as (11) could not be read from the D-structure level.

Partly due to this problem of dealing with ambiguity, and partly due to other factors such as the change in Chomsky's concept from syntactic rules as rules of transformation to rules of movement, it became obvious to Chomsky that semantic information must be provided by some level closer to the surface than that of D-structure. The result of these changes in analysis and understanding caused TG theory to evolve to the point that it was no longer recognized as TG. In 1977, Chomsky began a series of lectures entitled "Lectures on Government and Binding."[38] In these lectures and in further articles books Chomsky outlined the theory which was to replace TG theory: Government and Binding Theory.

3.3 - LF and Move-α

The two main elements which appear in GB theory which differ from those of TG theory are the LF level of

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[38]Collected and published as Chomsky [1981].

representation (which is derived from S-structure and which is the level from which meaning is understood) and the movement allowance 'move-α,' which, in addition to moving elements between D-structure and S-structure, is one of two rules through which S-structures are made into LF representations. 'Move-α' stands for 'move anything anywhere.'[39] It is the part of GB theory which allows movement of sentence elements at all levels of representation. It includes no restrictions on where or when movement may take place. Such restrictions are applied primarily in the form of barriers imposed on the move-α from outside.[40] It is clear that there must be such barriers or constraints on where and how move-α may be applied, since (for example) the sentence 'Rule the major comes play into S-structure in. . . ,' which is derived from the first sentence of the paragraph by numerous applications of move-α, is not an acceptable one. Among the many constraints on move-α, including barriers on from where and to where elements may be moved, are some which will be discussed in what follows. Move-α works in

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[39]Chomsky defines 'move-α' in [1981] 18. Constraints on move-α are discussed as they become relevant to Chomsky's discussion.

[40]Chomsky [1986a] is a discussion of types and instances of barriers. As move-α contains no implementation details, considering the types and uses of barriers is essential to understanding move-α.

conjunction with the projection principle and the Empty Category Principle, and as such will be further discussed in that context.

LF is the 'Logical Form' level of representation in GB theory. It is at this level where ambiguities of scope are made explicit through the application of various syntactic procedures. It is also the level from which meaning is said to be accessed. LF is perceived as being a syntactic level: movement to and from LF as well as within the LF level is accomplished solely by the use of syntactic rules. Nevertheless, it is in LF that semantic properties are considered, if they are considered in GB theory at all.

The two main movement rules which are utilized in LF are the above mentioned move-α and 'Quantifier Raising,' (QR). It is QR which serves to make scope ambiguities explicit, and in so doing to make the meanings of multiple quantifier sentences clear and to thereby eliminate systematically misleading expressions of this sort. The importance of quantifiers and QR in the discussion of LF is such that some background on the conception of quantifiers in GB theory and on the rule QR is necessary.

3.4- Quantifiers in GB Theory

The sense in which quantifiers are most commonly explained and understood is that which appears in basic first-order logic texts. Such conceptions consider 'all,' 'some,' 'several,' and 'most' to be quantifiers. Such quantifiers appear in sentences such as 'All women are mortal' in which case 'all' is considered to be the quantifier, and the scope of the quantifier is thought to be the part of the sentence over which the quantifier reaches.[41] By contrast the phrase 'this dog' in 'this dog is brown' is not considered to be a quantifier in this restrictive sense. GB theory employs a notion of quantifier in which this latter example ('this dog') is considered to be one. The theory employed is that of 'generalized quantifiers,' in which such phrases as 'this dog' or 'the girl' are considered quantifiers, have scopes, and bind variables.[42] As a result, in addition to sentences such as 'Most girls have hair' being considered quantified sentences, sentences such as 'The girl has hair' are also quantified.

The primary task of LF is to make the scope of quantifiers explicit. This serves to indicate which

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[41]Further discussion of the basic notions of 'quantifier' and 'scope' can be found in any introductory logic text or most discussions of syntax.

[42]See Westerståhl [1989] for a discussion of the theory of generalized quantifiers.

variables are bound by what quantifiers, as well as illustrating where and how scopes overlap and when scope ambiguity arises from different interpretations of the scope of quantifiers. These tasks are performed by uses (either singly or in multiples) of the rule Quantifier Raising.

As the name indicates, this maneuver 'raises' a quantifier (or an operator in general). Why this movement is called raising is best explained by reference to a tree diagram, and by referring to the notions of nodes and C-commanding. Without going too deeply into the details of the system, nodes are the points on a tree diagram at which the tree branches or extends straight down one level, and C-command is defined as follows: "a phrase α c-commands a phrase ß if and only if the first branching node dominating α also dominates ß."[43] When a quantifier is 'raised' it is moved outward in the sentence (usually towards the left), and a new node is attached to the sentence making the relation of the quantifier to the original sentence appear higher on the tree diagram than it did originally. By way of example take the following surface structure:

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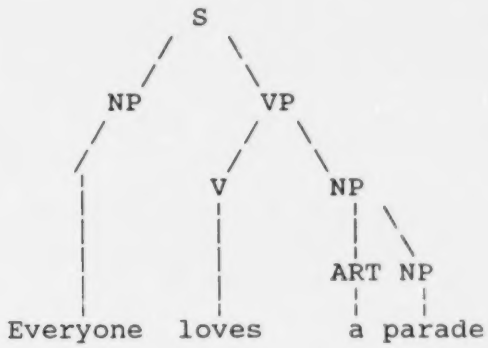
[43]Neale [1990] 173. Neale provides a concise and understandable explanation of both 'C-command' and 'Quantifier Raising' (the latter appears on 191-193).

(12) Everyone loves a parade.

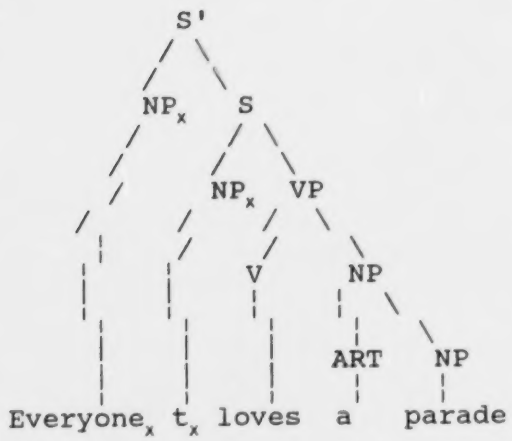
(13) is the tree diagram for the S-structure representation of (12):

(13)



The tree for the LF representation of (12) includes the raised quantifier adjoined to the sentence to form a 'meta-sentence':

(14)



As can be seen by comparing (13) and (14), the node which dominates the quantifier 'everyone' is raised up one node so that it is equal in height to the original S on (14), the tree representing the logical form of the surface structure expressed in both (12) and (13). This indicates both the origin of the term 'quantifier raising' and how quantifier raising works. The quantifier is moved to a place adjoining the sentence (this adjoinment is often referred to as C-adjoining or Chomsky-adjoining), and it is replaced by a trace whose subscript matches the original quantifier.[44]

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[44]Chomsky cites Robert May (who was a graduate student of Chomsky's at the time) for originating the idea of QR which is used in Chomsky [1981]. The source is May's Doctoral Dissertation, listed here as May [1982].

3.5 - ECP, Trace, and Variables

When move-α is applied, the moved element appears in the new syntactic position, but what happens to the position in a sentence from which something is moved? The 'Projection Principle' dictates that "once some syntactic position exists, it must have always existed and must always continue to exist."[45] Given this principle, it can be seen that when move-α empties a syntactic position something must be placed in that position -- either the content from another position or some sort of a marker. The first of these possibilities is illustrated by the following example of move-α.

(15) [$_{NP}$Mary] is as tall as [$_{NP}$John].

(16) [$_{NP}$John] [EC] is as tall as [$_{NP}$Mary] [EC].[46]

The instance of move-α illustrated by the change between (15) and (16) is a matter of moving the initial noun phrase to the end position in the sentence and replacing it by an empty category, and then repeating the procedure for the final noun. In such a case, when each noun phrase

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[45]Sells [1985] 42. Discussion of the subject also appears in Chomsky [1981] 38-40, where it is explained considerably more technically.

[46]As is standard practice when using the notation of GB theory, the only syntactic positions which are explicitly noted are those which are necessary for the example at hand.

is moved out of its position, there is a syntactic element with no semantic content inserted into the emptied position. These markers must be inserted in order to preserve the Projection Principle.

These markers must be clear in any syntactic diagram, but have no phonetic content. Because they are markers, rather than information carriers they have no semantic content, either. Chomsky set up a category of markers to be used for this purpose, and because the members of the category have no phonetic or semantic content they are called Empty Categories.[47] The primary purpose of all of the types of Empty Category is to mark places in sentences which had syntactic content before the application of a movement rule, but which have no phonetic or semantic content after an application of move-α or another rule such as QR.

In Chomsky's GB theory, there are four possible varieties of empty category: two types of trace, 'PRO,' and 'pro.' Three of these are of actual use at some level of syntactic representation: the two types of trace and PRO. The fourth empty category will not be relevant at all here and in fact there is some doubt that it has any

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[47]Chomsky's introduction to Empty Categories and the 'Empty Category Principle' (ECP) are in [1981] 55-74. Sells [1985] introduces Empty Categories on pages 42-43, and has an in depth discussion of the ECP on 61-66.

practical applications.[48] Of these remaining three empty categories, the ones which are relevant to this discussion are the those called 'trace.'[49]

Traces are part of a syntactic category, and their use is primarily syntactic. In fact, one of the uses of trace is entirely syntactic, without even peripheral semantic repercussions. The motivation for the other main use of trace is also a syntactic one, but this second use of trace (that related to Quantifier Raising) also exhibits semantic properties. The best way in which to examine the way in which traces work and also to see what semantic properties are held by traces is to first examine the purely syntactic use of trace and then to explore the second use of trace.

A purely syntactic use of trace, where the use of the trace neither reflects nor implies any phonetic or semantic properties, can be illustrated by use of what is referred to as 'the wanna' contraction.[50] It is clear in

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[48]Sells [1985] (67-68) claims the existence of four possible Empty Categories (two trace and two PRO), although only one PRO category actually appears in use. By contrast, Chomsky ([1981] 55-57) claims that three types of trace and one of PRO are used.

[49]An introduction to the subject of 'trace theory' appears in Radford [1988] 553-562.

[50]The wanna contraction is sufficiently interesting that it appears in many discussions involving syntactic problems and trace. For example: Chomsky [1981], Neale [1990], and

the surface structure of English that the first of the following two sentences is acceptable and the second is not:

(17) I wanna win the game.

(18) *Who do you wanna win the game?[51]

Both (17) and (18) exhibit the phenomenon of contracting the verb phrase 'want to' to its short form wanna, but our intuitions tell us that (17) is acceptable and (18) is not. The reason for the difference is illustrated by a consideration of the LF representations of the sentences (minus the contractions):

(19) $[_{NP}I]$ want to win the game.

(20) $[_{NP}Who_x]$ do you want $[_{NP}t_x]$ to win the game?

In (19), there is no feature between the word 'want' and the word 'to' and so the 'wanna' contraction is acceptable, while in (20) the appearance of the trace blocks this move. In (19), all that the trace does is to mark the place from where the 'who' is taken in the deep structure representation (which although not exactly of this form would contain the following information):

(21) You want who to win the game.

Radford [1988].

[51]The star before a sentence indicates that it is not syntactically acceptable.

In formulating an interrogative sentence (20) from this deep structure, the 'who' is taken from its position within the sentence and moved by move-α to a position at the beginning of the sentence. As is required in this case, a trace is left to mark the spot from which the 'who' is removed. In this capacity the trace serves to block the 'wanna' contraction which would make (18) a grammatically improper sentence. Note that in this usage, the trace plays absolutely no semantic role. It does not act as variable, which serves to indicate that 'Who' is not being used as a quantifier, and the place which is marked by the trace need not be marked for any semantic purpose.[52]

The other usage of the trace which has been alluded to -- the use with semantic properties -- is one related to Quantifier Raising. This usage is referred to as a 'variable' trace. The variable trace works in very much the same way as does the variable in logical language. Consider the following surface structure:

(22) The girl snores.

In linguistic notation, which makes syntactic roles explicit even at S-structure, (22) appears as follows:

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[52]The 'wanna' contraction is perhaps the most famous of the purely syntactic uses of trace. It is not, however, the only one.

(23) $[_S[_{NP}$the girl$][_{VP}$snores$]]$

The LF rule of Quantifier Raising (QR) moves the operator 'the girl' (which is an example of a generalized quantifier) out of the sentence to a position in front of the sentence and leaves a variable trace in its place as follows:

(24) $[_{S'}[_{NP}$the girl$]_x[_S[_{NP}\underline{t}]_x[_{VP}$snores$]]]$

The italicized t is the trace which indicates from where the quantifier 'the girl' was taken. The purpose of subscripts such as the 'x' in (24) is to differentiate traces in cases where there may be more than one and in so doing make it explicit which trace attaches to which operator.

One of the tasks of the level of Logical Form is the disambiguation of sentences of surface structure, and it is the manipulation of syntax through rules such as move-α and Quantifier Raising (QR), and the use of traces which result in the making explicit of the scope of variables.[53] In addition to being one of the purposes of LF, this disambiguation leads us to what the LF of a sentence must look like. Consider, for example, the surface structure

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[53]For an introduction to QR see May [1977] from which Chomsky takes his use of QR. There is also a concise explanation of QR in Neale [1990] 191-195.

(25) Everyone loves someone.

There are two possible ways in which to interpret (25), and each of the following representations in LF reflects one of them:

(26) $[_S[_{NP}\text{Everyone}_x][_{NP}\text{someone}_y][_S[_{NP}t_x][_{VP}\text{loves}[_{NP}t_y]]]]$

(27) $[_S[_{NP}\text{Someone}_y][_{NP}\text{everyone}_x][_S[_{NP}t_x][_{VP}\text{loves}[_{NP}t_y]]]]$

As the LF makes explicit, (26) and (27) have different meanings due to the different scope orders, each of which can be represented by the same surface structure. It is the fact that two different LFs are reflected by one surface structure which constitutes scope ambiguity, and it is one of the main tasks of LF to make this ambiguity explicit.

It should be noted that (27) is a logical consequence of (26). Some claims have been made that this fact suggests that only the logical form in (26) is necessary and that (27) is simply redundant.[54] Robert May concurs with this view in a 1983 paper, saying "multiplicity of representation is to be reserved for sentences with logically independent interpretations,"[55] but in later works May takes the view that such sentences as (25) properly have two logical forms. This change in point of

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[54]See especially Kempson and Cormack [1981a] and [1981b].

[55]May [1983] 10.

view is in keeping with the trends in philosophy of language, for at the time of May's earlier paper there was a move to deflate the logical forms of sentences with multiple quantification while now the view is that each possibility should be considered separately. Regardless of which of the above views is accepted, the usefulness of LF as a notational device for representing sentences with multiple quantification is clear. Specifying and studying the scopes of quantifiers in LF provides a way to consider sentences which express two or more possible propositions and notate them in an explicit way which indicates the proposition meant as well as its logical form.

The way in which trace is used in conjunction with the rule QR should look familiar to anyone who has studied formal logic, because they closely resemble the bound variables of symbolic logic in such cases. Clearly, to claim that 'trace' and 'variable' are different names for the same concept would be inappropriate, for as the 'wanna' contraction illustrates traces can be used in a way in which variables cannot. On the other hand, the second use of traces indicates that there is room for a comparison of the uses of traces in GB theory and variables in formal logic.

If one were to compare the LF representation of a quantified sentence with the formal logical representation

of the same sentence, it would appear that 'trace' and 'variable' were interchangeable. For example:

(28) (The x: girl x)(x has a red dress)

(29) $[_{NP}$The girl$_x]$ $[_S[_{NP}t_x]$ has a red dress]

'X' and 't_x' look as though they have co-extensive purposes. The facts, however, do not quite back up the appearances. Variables, in the logician's sense, are primarily semantic constructs. Their purpose is to convey that any object which is of the quantified class is appropriate to the sentence when inserted in the space marked 'x.' The variable marks a syntactic space, but this syntactic role is subsumed under the semantic one. For the trace, the roles are reversed. The primary purpose of the trace is to mark the position in the sentence from which the quantifier is taken. Any semantic content which can be read from this trace (for example that a truth value is generated when 't_x' is replaced by the appropriate content) is secondary to the syntactic purpose of the trace. Despite these differences between traces and variables, the way in which traces are used in QR and the way variables are used in quantified sentences of predicate logic are similar.

Chomsky has very little to say about variables in his GB theory. This is primarily due to the fact that Chomsky's interest lies not in the semantic properties of

GB but in the syntax.[56] The relationship between variables and traces has, however, been considered. Robert May makes the claim that traces can be equated with variables, but later in the same paper he qualifies his statement by noting that although traces "may be interpreted as individual variables, identifying them as such is not part of the syntactic induction of the language."[57] Perhaps the best way in which to explain the relationship between traces and variables is to say that sometimes traces exhibit the behaviour of variables. This is backed up by a rule of GB theory which states that "a trace is a variable if and only if it is Case-marked."[58] This statement indicates that variable is a sub-category of trace.

The partially co-extensive nature of traces and variables is valuable to this discussion particularly because of the connection which it establishes between LF and the languages of formal logic. Indeed, as will be seen later in this thesis, the relationship between traces and variables may prove to be the first step in drawing

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[56]Chomsky [1981] contains a brief discussion on traces and variables on 68-70.

[57]May [1990] 9.

[58]Chomsky [1981] 69.

together the philosopher's and linguist's theories of logical form.

3.6- A Wider View of LF

While an understanding of at least a few of the technical details of GB theory (and in particular the LF level) is necessary for an understanding of the linguist's theory of logical form, it is not the only thing which should be considered. In order to make a comparison between the philosopher's theory of logical form and that of modern linguists, some of the general features of LF must also be discussed.

GB theory (and thus the LF level) is a transformational theory of the structure of language. Its syntax is more fully developed than its semantics, and the syntax is of primary importance. The movements to and from the level of LF are made by syntactic transformations, and any semantic properties of the theory or of LF are secondary or even perhaps accidental. That Chomsky stays clear of semantics is made clear in the central text of GB theory (Lectures on Government and Binding) where Chomsky states that interpretation, even of referential expressions, is to be "considered to be in effect an extension of syntax"

rather than semantics of some sort.[59] Chomsky's claims that certain issues in GB theory are syntactic rather than semantic does not, of course ensure that they are, nor does it ensure that semantic issues are not relevant to GB theory. Indeed they are important in GB theory particularly in consideration of LF. While this is the case, Chomsky's avoidance of semantics remains a problem, for the logical form level of linguistic representation is intended to provide the bridge between language and meaning, and this fact indicates the need for some sort of formal semantics to be attached to logical form. Since Chomsky chooses not to address the semantics of logical form, this issue must be approached through the work of other adherents of LF such as Robert May.

Part of the purpose of the LF level is to provide the link between syntax and semantics, particularly meaning. The main sense in which sentences are transformed at the LF level is that quantifier scope is made explicit. The question of scope ambiguity can be considered to be a semantic one; at the very least the making explicit of scope ambiguities leads to insights about meaning and other semantic issues. One way which has been taken to explain the use of a syntactic solution to the problem of

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[59]Chomsky [1981] 324.

scope ambiguity is to claim that scope ambiguity is actually entirely a syntactic issue rather than a semantic one.[60]

LF level makes the syntax underlying the surface of sentences explicit. This is done primarily by means of making the scopes of quantifiers clear and specific. LF representations put quantifiers outside of sentences, and match anaphors with their antecedents. This whole process is one of disambiguation, and the disambiguation is considered to take place at a purely formal level, in syntax alone. Based on this stressing of syntax in GB theory, it may seem that there is no place for semantics, particularly at the LF level. That is not the case. Despite the fact that movement rules and QR are syntactic maneuvers which are allowed or blocked because of syntactic considerations, there is more than just syntax involved in GB theory. Part of the reasoning behind proposing the existence of the LF level is that LF is meant to make meaning clear and accessible. After all, the process of disambiguation, even if the ambiguity is claimed to be syntactic in origin, serves to make meanings clearer. Consider, for example previously mentioned

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[60]Discussion of scope ambiguity as a syntactic ambiguity, or even of it being a type of ambiguity separate from both syntax and semantics, can be found in Hornstein [1984] and Neale [1990].

surface structure (25), 'Everyone loves someone.' The two different possible LF representations for this sentence, (26) and (27) clearly have different meanings. This semantic fact is not clear from the S-structure sentence, but each of the possible scope interpretations is given an LF sentence, and these make the meaning clear. So it can be said that LF makes each possible meaning of an S-structure sentence explicit, but does not give any indication of which of the possible meanings is intended in any given utterance of the surface structure.

3.7 - Syntax and Semantics in GB Theory

Syntax and semantics are often talked about as though they are so far apart that they seem almost unrelated. Syntax is conceived of as involving structure in the absence of any semantic information, and semantics is thought to proceed independently of form or structure. Because of this perceived gap, the use of syntactic rules and barriers to bring out the meanings of surface structures seems odd. Syntax is commonly considered to involve the structure of language, and the structure alone, while semantics is thought of as dealing with content without considering form. This perceived dichotomy between syntax and semantics is, however, fading

from the meta-linguistic scene, and more fluid interpretations of the relationship between syntax and semantics, such as those of Higginbotham and Hornstein, are taking its place. Consider what has been said already about logical form (which is a syntactic level). Although the primary concern at the LF level has been with the structure of sentences, the parts of speech, and syntactic movement rules, it is not structure totally devoid of content, for in order to note that there can be two LF representations of a single surface structure there must be two possible meanings for the sentence.[61]

The purpose of the LF level in GB theory has been stated as being 'to make meanings of surface structures clear by making scope ambiguities explicit.' A consideration of the tree diagram which appears on the second page of this chapter indicates that the route from deep structure to surface structure and what we hear or see in natural language does not include LF. Movements to and within LF have no relationship to the way that the end product of language (PF) will look or sound. LF has no direct relation to what syllables and noises are made in

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[61]The chain of explanation might go from having two LFs to having two meanings or from having two meanings to having two LFs. Which of these is the correct way to look at the situation is uncertain.

language, its interest is in the meaning of such utterances.

Despite this interest in meaning, it would be too far reaching to claim that the linguist's theory of logical form has its own semantic theory. Semantics, in the logician's or philosopher's sense in general, includes a number of features which LF does not possess. Chief among these features is the ability to provide truth conditions for a given sentence (which GB theory as it stands is unable to do), and to decide among possible interpretations of a sentence which is right. Although LF notes ambiguities and makes them explicit, it does not 'solve' them. (That is to say that LF provides a sentence for each possible meaning of an ambiguous sentence, but has no mechanism for saying which one of the set is the one meant.) At the LF level, we are left with an ambiguity in meaning: the surface structure might mean LF sentence 1 or LF sentence 2. LF provides no way to choose between them, and no way to assign a truth value to either of them or to anything else. For these reasons, it becomes inappropriate to call the linguist's LF a truly semantic theory without the addition of a formal semantics to GB theory.

LF deals with one specific component of semantics: ambiguity. There appear to be no mechanisms within GB

theory for providing truth conditions for sentences or addressing synonymy, entailment, or any other semantic issues. If this is a problem at all, it can be solved in several different ways. One is to attach a semantic theory onto GB theory. Montague semantics is well suited to this task, and when (in Chapter 4) the semantics of the philosopher's and linguist's theories of logical form are discussed it will be Montague semantics which does semantic duty for the linguist's theory.

The other solution to the question of semantics and logical form is to deny the need for formal semantics, or to claim that GB syntax does what semantic theories do without the need for formal semantics. Norbert Hornstein does this.[62] Hornstein claims that formal semantics is not as far removed from syntactic theory as is ordinarily claimed, saying that "the theory of language can dispense with the standard idealization of language, an idealization that crucially involves a semantic level of description."[63] If Hornstein's claims about the extraneous nature of semantics as an area of inquiry into language are correct, then the LF level of GB theory brings us as close to a rigorous account of meaning as it

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[62]See Hornstein [1984].

[63]Hornstein [1984] 2.

is necessary to go, and formal semantics are not necessary.[64]

Having outlined several philosophers' theories of logical form as well as a linguist's theory, the background for a comparison of the theories is laid. Such a direct comparison will illustrate the strong and weak points of each theory as well as pointing out in which ways they are similar. A consideration of the theories of logical form also makes it possible to see whether LF can be incorporated into any or all of the philosophers' theories of logical form.

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[64]Hornstein suggests that semantics are not necessary because the work of pragmatics provides as much of an account of meaning as is necessary. As an account of pragmatics is outside the scope of this thesis, this part of Hornstein's discussion will not be considered. It seems, however, that his remarks are interesting in relation to GB theory and LF.

CHAPTER 4

LOGICAL FORM AND LF

4.0 - Introduction

Thus far in this thesis, several philosophers' theories of logical form and a linguist's theory of logical form (LF) have been reconstructed, each from several sources. Both the main philosopher's and the linguist's theories have been discussed separately, and in addition the philosophers' theories have been related to the tradition of analytic philosophy and the linguist's theory has been set within the scope of modern linguistics. What remains is to look at the theories of logical form in relation to one another. By doing thus it will be possible to see how closely they resemble one another in various different areas, to see if LF seems in some way better or more far-reaching than the theories of philosophers, and to see if any of the theories of logical form represent logical form as a real level of language.

The terminology within and surrounding the different theories of logical form vary due to the differing periods in which the theories were introduced and the backgrounds of the people espousing the theories. Although the

theories has been chosen to facilitate a comparison of the two, the vocabularies do not match up completely. Most noticeably, the technical vocabulary used in the description of the linguist's theory of logical form is developed further than that used in outlining the philosopher's theory. This does not necessarily mean that the linguist's theory is more detailed or technical than the philosopher's is capable of being, it is simply the case that technical detail plays a more central role in the linguist's theory than it does in those of the philosophers.

After a discussion of the different uses of the term 'logical form,' the logician's and the Davidsonian theories of logical form will briefly be compared to LF. This will be followed by a comparison of the analytical philosopher's theory and LF. There are a number of different ways in which the analytical philosopher's theory of logical form can be compared to LF, and a number of important issues exist which point toward whether the philosopher's theory or the linguist's theory is closer to capturing the point of logical form. A number of these issues will be discussed in what follows, ending with the most important set of issues. This last set involves the semantic function of logical form. As logical form the level at which semantic issues including meaning are

addressed, the best theory of logical form must be able to answer questions of semantic importance about sentences of surface structure and logical form, whether the logical form (of LF) level is considered to be syntactic or semantic.

4.1 - The Term 'Logical Form'

There is a sense in which in even the use of the term 'logical form' the linguist and the philosopher differ. As Robert May notes, "For the linguist, the term Logical Form is a proper name. . .For the philosopher, on the other hand, this term is a common noun. . .picking out some property of formal systems."[65] When the linguist speaks of logical form, she speaks of a theory which specifies rules, movement, and syntax for this logical form. It is a specific theory with specific syntactic elements and positions. For the philosopher logical form is not so specific, as May notes, and allows for the possibility of different sorts of forms to fill in the theory. "Logical Form (or LF) is a level of linguistic representation, closed under defined transformational mappings and conditions on structural well-formedness;

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[65]May [1990] 2.

logical form is a representation of the structure relevant for the truth-definition of the logical terms of the language."[66] This quote points to two main differences between logical form and LF: the general/specific dichotomy and the syntax/semantics dichotomy. The first of these has already been mentioned, and the second will be discussed later in this chapter. May's comments here and elsewhere also lead to the following distinction: "LF [is] the linguistic level, [and] logical form. . .is a property of this level."[67]

4.2 - Logician's Logical Form and LF

To compare the logician's logical form with LF is a somewhat easier task than that of comparing LF to either of the other philosophers' theories. The reason for this is that the basic structures of the two theories are quite similar. Each of the theories postulates the existence of two levels of language: in the logician's theory they are surface structure and intensional logic, and in the

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[66]May [1990] 2.

[67]May [1991] 336. This leads to statements such as the following: LF is a logical form. The implication of this, that the linguist's LF may be a specific way to construct the philosopher's logical form, is explored in the next chapter.

linguist's theory they are surface structure and LF. No intermediate levels are proposed, and there are no propositions discussed. This leaves two areas of comparison between the logician's logical form and the linguist's LF: what the logical form (or LF) level looks like structurally and notationally, and how the level is arrived at from surface structure.

As mentioned before, the language used to represent the logical form level in the logician's theory is that of intensional logic. The language of LF appears for the most part as the examples in the previous chapter indicate, although when appropriate all syntactic categories can be explicitly stated. For example, consider the LF representation from example (29):

(29) $[_{NP}$The girl$_x]$ $[_S[_{NP}t_x]$ has a red dress]

This is an LF which is abbreviated to show explicitly only the syntax necessary to make the point. The full LF would appear as follows:

(30) $[_{S'}[_{NP}[_{ART}$The$][_{NP}$girl$_x]][_S[_{NP}t_x]$

$[_{VP}[_V$has$][_{NP}[_{ART}$a$][_{ADJ}$red$][_{NP}$dress$]]]]]$

Clearly such detail would be inconvenient in a situation where the detail of a sentence such as (29) is sufficient. The fact that LF is capable of illustrating such detail is, however, a great advantage to the linguist.

By contrast, intensional logic, though it has greater detail than simpler systems of formal logic, cannot provide detail in such a way that it directly reflects the syntax of surface structure.[68] In this sense LF is clearly stronger than the logician's logical form, for the ability to represent all of the detail of language is a great aid in the understanding of the ways in which language works.

The second issue is that of the method for movement from surface structure to logical form (or LF). In this area, too, LF appears stronger, for it provides explicit rules for moving from the level of surface structure to LF. In intensional logic, by contrast, much of the process of translation from surface structure to logical notation is based on intuition. Because the move is explicit in the linguist's theory, anyone who knows the rules can perform transformations from surface structure to LF. No innate abilities are necessary and nothing is left to guess work.

From the discussion above it does not follow that the logician's and the linguist's theories of logical form are incompatible. In fact, the addition of the rules and notational devices to the logician's theory of logical

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[68]This will be discussed further later in this chapter.

form would result in a logician's theory with explicit rules and syntactic notation, as well as the truth-conditional semantics of intensional logic. This marriage of theories would then be stronger than is either of the two theories individually.

It is somewhat more difficult to reconcile LF with the logician's logical form proposed by Donald Davidson, because of Davidson's beliefs regarding quantification over events. What can be said about event sentences in LF? LF provides the mechanism to utilize the QR rule on a varied set of operators, so there is no reason to suppose that event sentences could not be quantified in GB theory at the level of LF. What is less certain is whether the proponents of GB theory would want to quantify over events in event sentences.

There is no discussion of any peculiarities involving event sentences in any GB text. Consider, from the second chapter of this thesis, sentences (4) to (7). Each of these sentences is an event sentence, and their LF representations would reflect this. They would not, however, be quantified over events in LF. This fact indicates that however compatible Davidsonian logical form and LF might be in other ways, they are incompatible due to their approaches to event sentences.

4.3 - Davidsonian Logical Form and LF

It is clear at a glance that LePore's Davidsonian logical form has less in common with LF than do the logician's theory or even Davidson's logician's theory of logical form. LePore's logical form claims to directly access truth through its use of a Tarski-like theory of absolute truth. By contrast, LF gives us no direction even as to whether or not truth is an absolute matter, far less access to the specific truth of a sentence in question.

This vast difference in projects between Davidsonian logical form and LF indicates that very little could be done to reconcile the two theories. LePore would likely deny the necessity of Chomsky's level of logical form, saying that it is not necessary to have such a level in order to access truth. Chomsky would likely say to LePore that it is impossible to reach any conclusions as to the truth of sentences without consideration of a level such as his LF level.

The incommensurability of the two approaches to logical form leaves only one task remaining in this consideration of the two theories together. Which theory is the better, or more appropriate, of the two. There is, to my mind, no absolute answer to this question. Clearly

to someone who holds that there is an intermediate level between surface structure and truth, any of the theories discussed in this thesis is preferable to that of LePore. On the other hand someone who maintains that there need be no level between surface structure and truth will tend towards a belief that LePore's theory is the best of those offered. As my inclination is towards a belief in the middle ground between surface structure and truth (and as I am suspicious of LePore's use of a system of absolute truth) I conclude that LePore's theory is missing something which is necessary in the consideration of logical form.

4.4 - The Principle Behind 'Logical Form'

The basic principle which underlies logical form, and the purpose of manipulations which reach from the level of surface structure to the level of logical form, is essentially the same for all of the theories of logical form which are being discussed in this thesis. Each of the theories recognizes that within surface structures there are ambiguities which make meaning unclear, and each theory considers it useful to make these sets of meanings explicit. Gilbert Ryle's central concern in "Systematically Misleading Expressions" is that some

surface structures (although he uses a different term) mislead users as to the contents or meanings of the sentences. The introduction of a logical form provides a mechanism by which the form leading to meaning is made clear in a way that it is not at surface structure. In the same way, the introduction of a LF level in linguistics is made necessary by the fact that meaning (or one of a set of possible meanings) cannot always be understood given a surface structure. The manipulations which transform a surface structure into a LF make the form of each possible meaning of a surface structure explicit.

Meaning is not always clear in surface structures, and there must be a level of structure at which meaning is made explicit. This is a claim which both the analytical philosopher's and the linguist's theories of logical form hold in common. There are, however, a number of differences both in the composition and structure of the logical form level and in the process by which moves are made from the level of surface structure to the level of logical form.

Both the philosopher's and the linguist's theories of logical form provide some indication of what logical form might look like. In the linguist's theory, detailed information about the appearance of LF is built into GB

theory. This structuring of LF, with brackets and subscripts, and which accounts for all possible syntactic units and sub-units, is considered to be the correct logical form, and the movement rules of GB theory are considered to be the correct way to get to logical form from surface structure.

The philosopher's theory of logical form also contains room for a specific structure for logical form, and the structures suggested are those of predicate logic, or intensional logic systems. Ryle does not choose a specific structure for the level of logical form which he proposes, but Russell uses a system of predicate logic to illustrate his points about logical form. In keeping with advances in how much detail can be expressed by formal logic, a more recent system than that of Russell will be chosen to represent the structure of the analytical philosopher's theory of logical form. The logic system which most fully reflects the detail of surface structure is a system of intensional logic, and so intensional logic will be perceived here as being part of the analytic philosopher's theory as well as of that of the logician. Specific notation is not an issue here, the concern is with the <u>type</u> of logical language chosen. As a result it is not necessary to choose between intensional logic systems; it is sufficient to say that the logical form in

the analytical philosopher's theory is represented by an intensional logic.

4.5 - Reflecting Surface Structure

There are three ways in which the analytical philosopher's and the linguist's theory of logical form will be compared in this thesis. The first is a comparison of the structure of the logical form and LF levels with respect to their ability to reflect surface structure. The second is a comparison of how each theory proposes to reach the logical form or LF level from surface structure. The final, and most important comparison is that of the power of each theory to deal with semantic issues.

Having chosen a system of logic which acts as the representation of logical form for the philosopher, it is now possible to directly compare the theories of logical form of the philosopher and the linguist. It quickly becomes evident in even the simplest sentences that the linguist's LF more accurately reflects the syntax of the surface structure language (whether this be English or some other natural language) than does the philosopher's logical language. Intensional logics allow for two quantifiers, several other operators (including modal and

intensional operators), constants, predicates, and variables. LF allows for noun phrases, verb phrases, adjectives, adverbs, prepositions, Empty Categories,and the operators which exist and are used in surface structure languages.

The advantage of a logical form whose syntax mirrors the syntax of the surface structure should be obvious. The impoverished syntax of a intensional logic (which is to say the fact that intensional logic does not label syntactic category and position explicitly) is inconvenient when trying to move from surface structure to logical form, and this syntax is problematic when comparing different sentences in logical form. Consider, for example, the following surface structures and their logical forms (according to the philosopher's sense):

(31) John is a lawyer. Lj

(32) John is a Canadian lawyer. Lj & Cj

The simple addition of an adjective to the surface structure results in the addition of a new predicate, for adjectives (like verbs) are treated as predicates in this logical form system. By contrast the LF representations of these sentences reflect the similarities as well as the differences in the two sentences:

(33) $[_{S}[_{NP}$John$][_{VP}$is$[_{NP}$a $[_{NP}$lawyer$]]]]$

(34) $[_{S}[_{NP}$John$][_{VP}$is$[_{NP}$a $[_{NP}$Canadian lawyer$]]]]$

Equally, the parts of speech of the last noun phrase of (34) can be specified if such specification is relevant to the display of the logical form. In the issue of the detail of syntax used, and in the sense of reflecting surface structure, LF is stronger than is the intensional logic used by the philosopher's theory of logical form.

4.6 - Moving Between the Levels

Another issue on which the two purported logical forms must be compared is on how logical form is reached from surface structure. In the linguist's theory, the method for moving to LF from surface structure is governed by explicit rules. Movement rules, some blocked by various barriers, are performed in the prescribed manner in order to reach LF from surface structure.[69] When there is more than one possible outcome allowed by a rule or series of rules, more than one LF sentence can be generated by a single surface structure. The method is consistent with intuitions about movement between surface structure and logical form.

The philosopher's theory, even when intensional logic is used to represent the level of logical form, does not

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[69]For a summary of the sorts of barriers which exist to block move-α, see Chomsky [1986a].

provide a clear cut way to reach logical form from surface structure. The translating of sentences of surface structure into intensional logic is based in large part on the intuitions of the translator. The rules for translations assist in the move from surface structure to logical form, but there is more to the process than rule use. This is not much to go on when seeking to study the logical form of a surface structure, and combined with the impoverished syntax of logical languages it makes the philosopher's theory of logical form look ineffective compared with the linguist's theory.

One area in which the philosopher's theory of logical form seems stronger than that of the linguist is in explaining why there must be a logical form level. This question is, after all, in the province of the philosopher, and it is not surprising that there is more emphasis on the conceptual reasons for logical form in the philosopher's theory than in the linguist's.[70] This emphasis on the part of the philosopher's theory is a way in which it proves to be stronger than the linguist's theory, and one of the issues that is raised in this philosophical discussion separates the two theories more

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[70]I do not intend to imply that logical form appears in linguistic theory without reason. However, the reasons for introducing a logical form level are clearly of less central importance to the linguist than to the philosopher.

than does any other issue. The philosophical discussion brings up the purported existence of something between surface structure and logical form that is not present in the linguist's theory: propositions.

According to the linguist's theory, all that must be done to reach LF from surface structure is to follow a set of movement rules. There is no level (such as propositions) which separates the S-structure and LF levels of representation.[71] By contrast, the analytical philosopher's theory claims that it is not possible to go directly from a surface structure to a logical form. There is an intermediate level: that of the proposition. While the logical form of a proposition is in some sense attached to the proposition, they are not one and the same, and the proposition can be grasped without explicit knowledge of its logical form. This intermediate level -- the proposition -- is somewhat peculiar in that it can be grasped without its (logical) form being grasped.[72]

If indeed there are propositions, and the level of propositions is an intermediate step in the move from

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[71]This stance on the part of linguists is not so much stated as inferred by the absence of any suggestion of the existence of an intermediary level.

[72]The level between surface structure and logical form is discussed in Wittgenstein [1922] and Ryle [1931] among others.

surface structure and logical form, then the philosopher's theory (despite its impoverished syntactic element and the lack of concrete rules for moving between surface structure and logical form) is to be preferred to the linguist's theory. This is so because if propositions are in some sense between surface structure and logical form then a theory of logical form must include a discussion of the level of propositions. If propositions are imaginary, or if they can be reduced to synonymy with their logical forms, then the linguist's theory has the advantage over that of the philosopher, for then propositions would be a false barrier between surface structure and logical form. It is not the aim of this paper to decide whether propositions are actual; that is a question outside the scope of this paper. The positions taken in each of the theories of logical form on the subject of propositions are relevant in that they differ as to the existence of propositions.

4.7 - Dealing with Semantic Issues

The most important area within which the two main theories of logical form under discussion must be compared is that of how they deal with semantic issues. As logical form is a level concerned with disambiguation and meaning,

it is clear that semantic properties are demonstrated by this level. This is so regardless of which theory of logical form is considered. Where the difference between the theories lies is that each theory provides a logical form which is capable of dealing with different types of semantic problems and issues with different degrees of facility. A case might be made to the effect that whichever of the two theories of logical form is able to deal with more of the questions of semantics is the closer to capturing the essence of what logical form really is.[73]

A standard semantic theory deals with a number of issues which are related to meaning, such as truth conditions, synonymy, ambiguity, and entailment. It is apparent from studying the original intentions of each of the theories of logical form presented here that the theories are intended predominantly to deal with questions of ambiguity, specifically scope ambiguity; the usefulness of each of the theories in dealing with other semantic issues is less clear.

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[73]In researching the possible semantic component of the linguist's logical form, a number of works were of use. These include Chomsky [1981], Jackendoff [1972], Lycan [1984], and Moravcsik [1975]. More recent considerations of this topic include Neale [1988] and May [1989].

Intensional logic is standardly perceived as having an attached truth-conditional semantics. Such semantics (at the very least) give truth conditions for the logical language, and address questions of logical truth (and falsity and indeterminacy), equivalence, consistency, entailment, and validity. The use of the syntax of intensional logic in the philosopher's theory of logical form entails the addition to the philosopher's theory of the corresponding semantic theory. Thus, while the philosopher's theory of logical form may not be able to address all possible areas of semantics, it can address at least all of the issues dealt with within the scope of the semantics of intensional logic.[74]

A look at GB theory indicates that semantic concepts are not of much interest to Chomsky's approach to LF. The rules for moving to and from the LF level are purely syntactic, and the reasons for movements and indeed for the level of LF are explained virtually without making mention of semantics, and with only a cursory mention of meaning at all. In the whole of his discussion in Lectures on Government and Binding, Chomsky mentions the semantic element or nature of LF only briefly and

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[74]The discussion here of the semantics of logical languages is only cursory. Only general semantic features, such as truth, ambiguity, and denotation, must be considered in order to make the comparison needed here.

sketchily. Chomsky attempts to distance semantic properties of LF from the rules and appearances of LF as is seen in the following:

> Note that this step in the process of interpretation is not to be confused with what might be called "real semantics," that is, the study of the relation between language or language use and the world. Rather, it should be considered to be in effect an extension of syntax, the construction of another level of mental representation beyond LF, a level at which arguments at LF are paired with entities of mental representation, this further level then entering into "real semantic interpretation."[75]

Whether Chomsky is attempting to extend the boundaries of syntax into what is usually considered to be semantics, or whether all of the properties of LF which appear to be semantic are in reality syntactic, is unclear. What is clear is that within GB theory as conceived by Chomsky, there is essentially no formal semantic component.[76]

While Chomksy may shy away from the semantics of LF, there are semantic elements related to LF which are being

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[75]Chomsky [1981] 324.

[76]Hornstein [1984] offers a theory in which formal semantics is only of minor importance, and in which syntax and pragmatics provide all that is necessary for understanding language. This theory is in keeping with Chomsky's lack of interest in concepts which he considers formally semantic.

discussed.[77] Whether intentionally or by fortunate accident, the LFs of surface structures do exhibit at least some semantic characteristics. A purpose (if not the only tangible purpose) of the level of LF is to make explicit scope ambiguities. Ambiguity is standardly conceived as being a semantic issue, although perhaps a case could be made for calling scope ambiguity a syntactic problem. Even if this ambiguity turns out to be outside the range of what is considered to be semantic, the solving of scope ambiguity is an aid to determining meaning, and meaning is clearly an issue related to semantics.

While the LF level is the portion of GB theory which addresses questions of meaning, and is the level of representation at which meaning is supposed to be able to be read off, there is no mechanism provided within GB theory for connecting the LF of a sentence and what the sentence means. Specifically, LF (and GB theory in general) provides no mechanism for assigning truth conditions to sentences. In order to talk about the semantics of LF, then, it is necessary to import and attach a semantic theory to GB theory. This importation

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[77]May [1989b] is explicitly about the semantics of LF. The subject of semantics and LF has become increasingly popular in the last several years.

is, in principle, possible, but depends in part upon whether LF is considered to be a formal language or part of a natural language system.

Why this distinction between formal and natural is important is illustrated in a discussion of the 'Principle of Compositionality.'[78] The suggestion made, which follows Frege's Principle, is that it is possible to "let the rules for specifying truth conditions work, as it were, in tandem with the syntactic rules. The idea is that the syntactic generation of each sentence will be mirrored or 'recapitulated' semantically."[79] The importance of the distinction between formal and natural languages is that Chomsky, in his 'Aspects' period, claimed that "to import this principle [of compositionality] from logic into the study of natural language semantics is mere dogma -- false dogma at that."[80] Whether after introducing GB theory and the LF level Chomsky continues to hold to this opinion is

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[78]The Principle of Compositionality, or Frege's Principle, puts forward the idea that rules for assigning truth conditions work in parallel with syntactic rules. As such, for each syntactic generation or transformation rule, there would be a semantic rule. This Principle is further explicated in Dowty, Wall, and Peters [1981]. Partee [1984] is a discussion of this principle in relation to Montague semantics.

[79]Dowty, Wall, and Peters [1981] 7-8.

[80]Dowty, Wall, and Peters [1981] 9.

uncertain, but at least the adherents of Montagovian semantics disagree with the distinction. Even the suggestion of such a distinction seems odd in light of GB theory which essentially proves that natural languages such as English can be viewed as formal. Particularly given the formal and rule-governed nature of GB theory there is no reason to suppose that a system such as Montague semantics could not be attached to GB theory and thus to the LF which is used in the linguist's theory of logical form.

In discussions of the semantics of LF, a semantic theory such as Montague Grammar can be successfully attached to GB theory. When this is done it can be seen that the linguist's logical form has semantic properties that can be discussed and compared with those of the philosopher's logical form. It can then be said that LF leads to the assigning of truth-conditions to sentences, and also that it deals with the other features expected in and of a semantic theory. The attaching of semantics to logical form means that both the philosopher's logical form and LF have the power to perform semantic tasks. This leaves these two theories on approximately even footing with respect to semantic issues. Neither theory is substantially stronger or weaker in this sense.

The most noticeable difference in effectiveness between the two theories of logical form is that the syntax of LF more closely resembles that of its surface structure than does a syntax attached to the philosopher's logical form. It is not, however, clear that this resemblance is necessary. Why should logical form look a great deal like surface structure? Our intuitions provide the answer to this question. In most cases, the meaning of a surface structure can be read clearly from the surface structure without the intervention of a complex sentence of LF. That is to say, the LF of a surface structure is often very similar to if not the same as the surface structure itself. As this is the case, it seems rational to suppose that the form of LF is similar to the form of surface structure representations. By contrast, even in cases where the symbolic logic representation of a surface structure is straight-forward, there are marked differences between the original sentence and the logical representation.

The comparison which has been made between the analytical philosopher's theory of logical form and the linguist's LF theory has turned up several pieces of information which are of use in attempting to decide which theory is more powerful and effective. LF appears to be a stronger theory both from the point of view of the

appearance of the component which reflects logical form and from the point of view of movement between the levels of surface structure and logical form (LF). The semantic power of the theories seems to balance the other. The one main difference between the two theories is whether or not there is a level of propositions between surface structure and logical form. If there is, then the philosopher's theory has it right, but if there is not, then the logician's theory is the better.

The discussion thus far in this thesis does not enable us to say that one of the theories of logical form is correct and the others should be discarded. This is partly because answering the questions posed about propositions is beyond the scope of this thesis, but also partly because it may well prove more useful to combine the features of several theories of logical form than to discard the least useful and any useful information it might contain.

Important questions in the discussion of logical form remain unanswered, and must be addressed if this treatment of logical form is to be considered adequate. Some of these questions have broad implications both in philosophy and linguistics, and the next section will be devoted to providing at least some of the answers which need to be made.

CHAPTER 5

BIG QUESTIONS, LITTLE ANSWERS

5.0 - Introduction

There are five major theoretical questions on the subject of logical form which should be addressed before this thesis is completed. Discussing these five questions, and potentially answering them, is the task of this final chapter. The first of these questions is "is logical form real?" It is in some ways the central question in the debate about logical form, for if logical form is real, it opens up a door to a more advanced way of understanding language, and if it is not, then it has only the limited usefulness of a theoretical construct. The second question hinges on the first; if logical form is real, it must look like something -- does it look and act like LF?[81] The third question is whether there are propositions which exist somehow between surface structure and logical form.This question is one which is too broad in its implications to be solved here as a secondary issue, but must be addressed in slightly more detail than it has been in the thesis thus far. The fourth question

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[81]This can be phrased as May's question ([1990] 2), "Does what is dubbed "Logical Form" have the property of being a logical form?"

is can the linguist's LF could be incorporated into the philosopher's theory of logical form? If it can, this might provide a tidy way in which to reconcile apparent differences between the different theories of logical form. Finally, the question of whether logical form is somehow universal is becoming an important one in the philosophical community, for the question of the relationships between languages and between the logical forms of languages is a key to a better understanding of natural languages. Is logical form the connection between different languages? Whatever answers may be found to the questions mentioned here, the discussion of them may afford insights into what logical form really is.

5.1 - The Reality of Logical Form

Is logical form real? Is there a level of language which underlies surface structure which makes certain ambiguities explicit, and from which meaning is read? There are two senses of 'reality' in which logical form might be said to be real. First, it might be said to be a real level underlying language in the same sense as atoms are said to underlie matter. The second, more interesting sense in which logical form might be said to be real is in the sense of psychological reality.

The way in which to show that logical form may be real in the first sense is as follows. If the existence of a logical form level is the only effective way in which to explain some facet of our language use and understanding, then it probably does exist. It sometimes seems to a tedious or even nearly impossible process to go from a surface structure to its meaning. On the other hand, it is a process of rules and relatively straightforward thinking to derive from a surface structure its logical form and from the logical form a meaning.[82] If the move from surface structure to meaning is not entirely rule governed, then intuition must be appealed to. A practice which is entirely rule governed is easier to follow than one which depends partially on intuition, so when given these two alternatives, the best bet seems to be to conclude that logical form does exist, and to make use of it as such when pursuing issues in linguistics and in philosophy of language. This conclusion is, of course, may change subject to new or overlooked information, but it is the best alternative at present.

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[82]Of course, if there are rules for the move from surface structure to logical form and from logical form to meaning, then the move from surface structure to meaning is entirely rule governed. It is the case, however, that the task is more complex without the intermediate level of logical form.

What has been said above is essentially an argument for the reality of logical form in the scientific sense of reality. By this conception of 'real,' the best of a series of competing theories is perceived as being the correct one, and any other criteria are secondary. The other sense in which logical form can be considered real, one which is more to the point in relation to actual language use, is the sense of psychological reality.

Logical form can be said to be real if it corresponds to and is backed up by the way people form and use language. That is, if what happens in our heads when we prepare a sentence for use in conversation is a tacit procedure of rules such as those of LF, then logical form (and specifically LF) is real. Whether or not LF is real in this second sense cannot be proven, because we don't know exactly what happens in our heads in the process of language formation. It is plausible to say that LF might be real in this sense, but no concrete conclusions can be made.

5.2 - LF as an Example of a Logical Form

Whether or not logical form is real, it is a useful theoretical entity when discussing the structure of language. The next question which must be addressed is

whether Chomsky's conception of LF is adequate to be called the logical form of surface structures. As was discussed in the last chapter, LF has a number of points in its favour when philosophers are looking for the correct theory and correct physical appearance of logical form. In particular, LF has a syntax which mirrors that of the English language and rules which move the user from surface structure to LF or from LF to surface structure with the least possible pain. With the addition of Montague semantics, LF (as a part of GB theory) is as semantically viable as any other theory of logical form which might be proposed.

The only thing which may cause us to think that LF not be the correct form of logical form is its complexity. It might be argued that a simpler system of syntactic representation, such as that of intensional logic, is adequate to the task of showing the logical form of English and that LF is unnecessarily complex. That would be a good argument against the idea of LF as logical form, except that a good argument can be given for having a complex LF. The English language, as surface structure, is extremely intricate. Any system which purports to show the logical form of this complex natural language must be prepared to reflect in logical form the complexity and detail of the surface structure. As has been argued

previously, LF does this while the languages of formal logic seem to oversimplify the issues involved. For reasons involving the complexity of the language issue, and because of the fact that LF provides a methodology for the move from surface structure to logical form, LF has a strong claim for being considered to be the correct logical form.

5.3 - Are Propositions Part of this System

The third issue for discussion, the existence of propositions, is in a sense the most far-reaching question to be discussed here. In addition to the relevance of propositions to the discussion of logical form, propositions play a role in a number of other areas in the philosophy of language. Were it possible to refute claims of the existence of propositions in this setting, the re-evaluation of talk of propositions in at least a few other areas would become necessary. Be that as it may, whether propositions do or do not exist (at least whether they exist somehow as a level between surface structure and logical form) is important in that one of the theories of logical form under discussion accepts their existence in this sense and the others deny it. A desire for simplicity points toward the LF concept of logical form

(or even the logician's logical form), as it is easier to conceive of logical form without an intermediate level of propositions. Simplicity is not a rule, however, but a guideline, and so the existence of propositions cannot be dismissed with such abandon.

Is there a level of propositions which must be crossed in order to reach logical form from surface structure? As it is not possible to physically access such a level, it is difficult to say for certain whether the level exists. In that the use of such a level explains why surface structures can be understood without a conscious understanding of their logical forms, the level is useful. On the other hand, this feature could be claimed to be a facet of either surface structure or of logical form, and as such propositions might be done away with.

5.4 - LF as Part of the Philosophers' Theories

This stance on propositions leads directly to the next question up for discussion: can the details of LF be somehow incorporated into the analytical philosopher's theory of logical form? I believe that there is a way to reconcile the mechanistic approach of LF with the intuitive beliefs espoused in the philosopher's theory of

logical form. If the properties which the philosopher's theory assigns to propositions are given to some other level, as suggested, then the largest difference between the two theories has been removed. Two issues remain: is the move between surface structure and logical form rule governed, and is the notational detail of GB theory more appropriate to the logical form of English than is the more simplified syntax of a language of formal logic. I have already argued that the answer to this second question is yes, and I see no reason why those who espouse the philosopher's theory of logical form would not agree. As for the first question, in considering the philosopher's theory of logical form, a definitive answer to this question has never been made. For the most part the opinion seems to be that there are elements of intuition included in the move from surface structure to logical form, but also that if rules could be produced which make the move clear those rules may well be accepted as correct. LF provides the rules, and it seems plausible to say that they might be considered as correct. Thus it is tentatively possible to say that LF can be incorporated into such a theory of logical form as I call the philosopher's theory.

LF could be added to the logician's theory of logical form without too much difficulty, because the major

differences between the two theories are notational. On the other hand, adding LF to the Davidsonian theory of logical form is problematic for several reasons including the differing treatments of event sentences. It is particularly hard to reconcile LF and LePore's varient of Davidsonian theory. What is clear from the comparison of LF and each of the philosophers' theories is that there is reason to propose the use of LF within the discussions of logical form had by philosophers as well as by logicians.

5.5 - Logical Form and Languages

The final question is the one of whether there is a link between the logical forms of different natural languages. This might be called the "practical application of logical form" for if logical form is universal, or if there are rules that can be found which allow us to move from one language's logical form to another's then the understanding of natural languages would be increased markedly. Wittgenstein, had this question been put to him, would probably have said that there is indeed one logical form which underlies all languages. This is consistent with his claims in the Tractatus that one single proposition underlies sentences in different languages which mean the same thing. This

position does not have such strength today. After all, different languages have different ways of putting things, so we would expect their logical forms to differ in a way similar to their surface structures (although not as widely). Consider the following simple examples, whose logical forms are identical to their surface structure representations:

(35) It is snowing $[_{S}[_{NP}It][_{VP}is\ snowing]]$

(36) Il neige $[_{S}[_{NP}Il][_{VP}neige]]$

The fact that English puts an auxiliary verb in the above sentence ensures that the logical forms of the two sentences are, like the surface structures, slightly different. However, the basic forms of the sentences bear a great deal of similarity. In sentences in which the LF differs from the surface structure in a notable way, the pattern is that the surface structures of two sentences of the same meaning in different languages are some distance apart, the LFs are closer together, and the truth conditions are identical. The fact that the LFs are closer together than are the surface structures introduces the possibility that there are rules which lead from the logical form of English to the logical form of French (or the reverse, or from any natural language to any other natural language) even though such rules do not exist at the level of surface structure. Then the possibility

exists that these rules can be used to determine connections between different natural languages. Since there are claimed (in GB theory) to be rules to move between LF and surface structure in any language, all of the mechanisms required for translation from one language to another could be implemented.

The gap between languages which allows intuitive or interpretive translation but not any certain and straightforward translation has not yet been bridged. The introduction of LF and the rules of LF take us one step closer to finding the key to movement between languages, because they provide the key which connects syntax and meaning within each natural language. Using the rules of LF in combination with knowledge of language which is already available, it may become apparent that languages are more closely related than previously determined, and new insights may be gained into the understanding of natural languages in relation to one another.

If I am right, and LF provides the key not only to finding meaning from surface structure within a language, but also to accessing the surface structure of one language from that of another, then LF is indeed a powerful tool. In a sense, LF is also the natural product of evolution from the earlier philosopher's theory of logical form. With available knowledge about syntax in

the earlier part of the century, and with the theoretical background common to early 20th century philosophers of language, the philosopher's theory of logical form is an appropriate product. With the growth and expansion of syntactic theory and the changes taking place in the philosophy of language now, LF has become possible and accessible even to those with only a vague background in linguistics. The move towards scientific and sometimes mechanized explanations for natural phenomena has not bypassed philosophy, and philosophers of language are responding to this move by considering the merits of theories which claim that language is an entirely rule-governed part of our lives even though we are not conscious of implementing the rules on a day to day basis.

In this sense, a case can be made for claiming that the linguist's theory of logical form is not in competition with the philosopher's theory, but is the future of it. This can be seen to be so in the work of a number of philosophers of language who follow linguistic theories of logical form and are attempting to fit them into the world of philosophy of language. Certainly the very least that can be said is that the gap between philosophy of language and linguistics, that between the two theories of logical form discussed here, and even the

gap between syntax and semantics are becoming smaller as our knowledge in these areas increases.

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